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A higher and a lower plant or two representatives of the same group were tested simultaneously. The experiments were carried out in tap water at a constant  $p_H$  (approximately 6.0). The oxygen content of the water was determined by Winkler's method. The experimental setup has been described in detail in a previous communication (1). In the experiments mentioned below, two specimens of each species of plant were exposed to the light of a 300-watt lamp placed at a distance of 25-30 centimeters and switched on in the evening, while two other specimens of the same species were kept nearby, but covered with a black hood. At the expiration of 12 hours, the intensity of the photosynthesis was tested at two intensities of illumination, 14,000 meter-candles and 1,500 meter-candles. The results of the experiments in question are listed in the appended table.

It can be seen that the intensity of photosynthesis is higher in all cases after darkening than after illumination. While in the case of the higher plants, the amount of photosynthesis is only slightly lowered by the strong illumination and comprises 88 percent of that shown by the darkened plant, the corresponding ratio amounts to 52 percent in the case of algae. With the weaker illumination, the photosynthesis of higher plants is found to be lowered to 86 percent in the case of the higher plants and to 57 percent in the case of algae, as a result of previous exposure to light for 12 hours.

One may note the higher total intensity of photosynthesis shown by algae as compared with flowering aquatic plants. Chara is the only exception, but the specimens of that plant were in an inferior condition. This specific difference in the identical medium has been ascribed to internal factors involving accumulation and utilization of assimilated products (3). Algae threads, as distinguished from the shoots of flowering plants, do not provide any drainage from assimilating cells, so that the products of assimilation formed in these cells during periods of illumination accumulate there, inhibiting further photosynthesis.

This explanation does not cover all experimental data, however. Chara and Amblystegium riparium, notwithstanding the fact that their structure consists of leaves and stalks, react to darkening by an increase in photosynthesis amounting to 88 percent, while leaves of pond weed (Potamogeton) which had been detached from their stalks show, under identical conditions, an increase of only 5 percent. Apparently the specific difference shown by the two systematic groups investigated here is caused by something more complex than mere anatomical and morphological difference. M. N. Chrelashvili (6) has shown that accumulation of carbohydrates in the leaves has different effects on photosynthesis, depending on the nature of the substance which are accumulated and also on the general nature of the carbohydrate metabolism. He demonstrated this by comparing the behavior of plants storing sugar with those which accumulate starch and those of the intermediate type. It is obvious that the respective enzyme mechanisms also play an important part in establishing the differences referred to.

We are planning experiments with both groups of plants that will involve a study of the effect of artificial changes in the carbohydrate content and carbohydrate balance on the amount of photosynthesis.

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## Effect of Light Regimen on Photosynthesis

Photosynthesis (in mg O<sub>2</sub> per hour per 0.1 g. of dry weight)  
at the Intensity of Illumination

	High, After		Photosynthesis in Specimens Exposed to Light (expressed in % of effect in dark- ened plants)	Low, After	
	<u>Exposure to Light</u>	<u>Darkening</u>		<u>Exposure to Light</u>	<u>Darkening</u>
<u>Lower plants</u>					
Spirogyra sp.	2.41	4.33	56	-	-
Rhizoclonium hieroglyphicum	0.87	2.48	35	0.05	0.41
Hydrodictyon reticulatum	2.89	4.94	58	0.18	0.43
Vaucheria sp.	0.86	1.48	58	0.	0.13
Chara fragilis	0.16	0.28	57	-	-
" "	0.08	0.16	50	-	-
Amblistegium riparium	1.87	3.51	53	-	-
<u>Higher plants</u>					
Elodea canadensis	0.94	1.10	85	0.22	0.29
Ceratophyllum demersum	1.02	1.14	89	-	-
Potamogeton praelongus	0.94	0.99	95	0.37	0.41
Potamogeton praelongus	0.80	0.84	95	-	-
Hottonia palustris	0.53	0.62	85	-	-
Callitriche verna	0.87	1.15	76	-	-

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